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VOL IV.—No. 78.

THE DIRECT UNITED STATES CABLE.

IN our last we gave a full account of the meeting of the shareholders of the Direct United States Cable Company, on March the 28th, at which the various shareholders reviewed very freely the proceedings of the directors, and the causes which have led to the shares of the company being at 60 per cent. discount.

It appears to us that the root of the whole matter has been entirely ignored by the speakers at the meeting.

In an ordinary contract for engineering work the contractor has to perform a certain work under penalties by a certain date. If the contractor performs his contract, his duty is ended, and the failure or success of the enterprise rests with those who have embarked in it. And, on the other hand, any failure in the execution of the work has to be met by a pecuniary loss on the part of the contractor.

In ordinary engineering work, the work is specified by a responsible and experienced engineer, who represents the directors and shareholders of the company for whom he is acting, and he is met on the part of the contractors by an engineer, or agent of experience in the same species of work. In such cases there is very little misunderstanding between the two representatives of the contracting companies or firms as to what has to be performed. Each has seen through the contract and specification before it has been signed. Each knows every particular point; and unless something very unforeseen occurs, every small point affecting the interests of the employers on each side of the contract is jealously watched; small disputes and discussions arise, mutual and honest concessions are made, and eventually the work is carried out to the satisfaction of both companies.

For this to be effected it requires that on both sides men of known experience in the work to be performed, and in whom each contracting party have confidence, should be appointed to act. For a short period after telegraph cables became a matter between contractors and companies, this system was not followed, and the consequence was, cables failed, disputes arose, and in fact, for some years "the trade was spoilt," and for this period nobody would touch telegraph cables as an investment. Gradually the matter between contractors and companies was brought to a healthy issue; engineers were regularly employed by the companies to prepare the specifications, to test the cables during manufacture, and to watch the interests of the buying company during the laying of the cable. The Direct United States Company and the contractors seem to have ignored all this previous experience, and they seem to have gone back to the middle and dark ages of telegraphy.

A cable had to be laid across the Atlantic, an operation which had five times before been successfully carried out. The simple and obvious means was, on the part of the contractors, to engage engineers who had experience in such work; and on the part of the company to engage the services of engineers accustomed to the duties of acting on the part of telegraph cable companies.

Had this simpler process been adopted, it seems highly probable the work would have been carried out at the proper season with the same success as before; a repairing ship would have been ready for the first repairs, and the word "consecutive" would have been inserted in the contract, as it always has been in previous contracts.

BLOCK SIGNALLING.

(Continued from page 116.)

MESSRS. TYER and Norman's latest form of instruments possesses considerable advantage over the earlier form of instrument employed by Mr. Tyer. The difficulties arising from the use of two plungers placed side by side—one for the *block* signal and the other for the *clear*—has been overcome by the use of a mechanical switch or reversing key, seen in the front of the instrument (fig 24) showing "down line clear." This switch performs, in fact, the same duty as that employed by Mr. Preece in his single wire system, of which it appears to be an offshoot. By twisting the knob immediately below the indicator referred to, in one direction, the indication "train on line," and by turning it in the opposite direction "line clear," is brought up to the opening which in the figure shows "down line clear." The complete action in the one direction places one pole of the battery to earth and the other in connection with the signal or bell key, whilst that in the opposite direction reverses them, bringing the opposite pole to the key. When it is desired to clear or block the line, therefore, it is necessary, as in Preece's system, to first set the switch at blocked, or clear, and then press the signal key.

A further improvement consists in an arrangement by which the co-operation of the signalmen at either end of the section is necessary to send and receive the "line clear" signal. The indicator portion of the instrument is normally out of circuit, and is only put in circuit on the receipt of the signal on the bell, or gong, indicating that the line is clear. The indicator portion is then put in circuit for receiving the usual indication, and when this has been done the instrument is again disconnected.

A gong is used for down trains and a bell for up trains. Two plungers are still used, one for bell signals only, the other for train signals only.

Fig. 24 represents a complete set of instruments required to work the up and down traffic on one side of a signal-box, *i.e.*, an intermediate signal-box would require two such sets, but the other set, instead of a gong, would be provided with a bell. Gongs are not, however, imperative; bells of different tone can be employed where preferred. Needle indicators—as shown—or semaphore arms, as used by Preece and Walker, can be employed according to taste. The upper arm or needle is

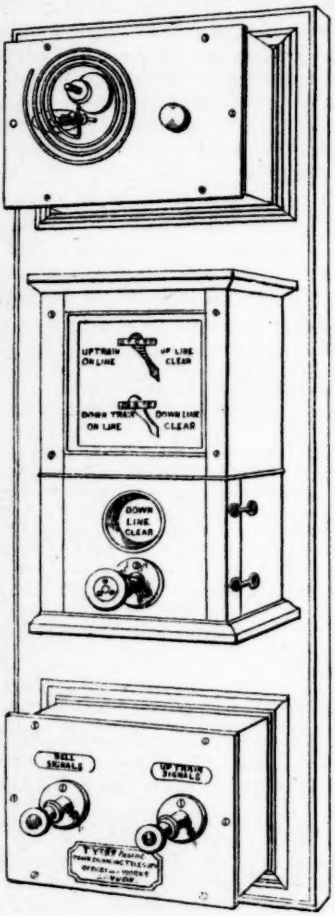


Fig. 24.

the block signal for trains proceeding from the signal station at which the instrument is fixed; the lower arm the reflex of the block signal at the next signal-box.

The exterior indicator on the dial is moved by a piece of steel—not a permanent magnet—which is suspended near to one of the poles of an electro-magnet in direct communication with the battery. Every current which flows from the instrument passes through this electro-magnet, and hence every current induces fresh magnetism into this piece of steel, giving it, however, in all cases the same polarity. The piece of steel which retains a portion of the magnetism thus imparted, and which may thus virtually be regarded as a permanent magnet plays, hetween the poles of other electro-magnets, which are brought into circuit with the line wire, and the passage of the requisite current—say copper for the "clear" signal, and zinc for the "block"—exercises the usual influence upon it, producing the two motions required—blocked and clear.

Messrs. Tyer and Norman have also applied their system to permanent current working, employing, as is usual, three wires. Improved as the system is, it yet lacks the repetition obtained from the distant station secured in Preece's. As in former instruments, the indication of the last signal sent is obtained by the outgoing current, the objection to which remains as strong as ever.

The different descriptions of instruments mainly used for block signalling purposes have now been described. Worked in combination with some of them are means for locking the levers working, the outdoor signals, &c. As, for instance, with both systems produced by Mr. Preece, any number of signal or point levers may be locked or unlocked by the current actuating the electric signals. Messrs. Tyer and Norman have also a means of effecting the same. Mr. Preece's are, however, the only systems which admit of the electric signals interlocking each other. This is effected by means of the switches (fig. 15) which at junctions are arranged in one frame, and which operate a sliding bar fixed below the base-board. Let fig. 25 repre-

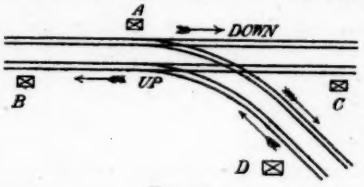


Fig. 25.

sent a junction with signal-boxes at A, B, C, and D. B A, A C, are two sections of a main line, A D one section of the branch. A down branch train will cross the up main line at A. All up main trains will cross the down branch metals, and foul the up branch; and an up branch train will foul the up main line metals at the junction points. To work such a junction with perfect safety no two trains, which in their due course of running would foul each other's metals, should be admitted within either of the junction sections at the same time. Take, now, a down branch train. It will cross the up main metals at A. Before it is allowed to start from B, A should consequently block all up main trains at C; and this being done, then admit the train at B, and on its passing clear of the crossing at A again clear C. In the same way with an up main train before it is allowed to leave C, the up branch road at D and the down branch trains at B should be blocked. Again with up branch trains, before they are allowed to leave D the up main road at C should be blocked. All this is done with certainty by the junction switch, the locking arrangement preventing mistakes precisely in the same manner as Saxby and Farmer's interlocking frames. In practice the

branch line is kept blocked and the main line clear, which simplifies the working. The distance between the signal-boxes should of course be regulated to the traffic.

We have now to consider the general principles upon which such signals may be worked, for upon this depends the safety of the traffic as much, or more, than upon the instruments themselves. A bad instrument may, with judiciously arranged instructions for working it, be rendered almost as useful as a more perfect form of instrument; and again, the advatages of the very best form of instrument may be entirely thrown away for want of an efficient mode of working it. The drawing up of the working instructions is not, strictly speaking, the duty of the telegraph engineer, but he is generally, and always should be, consulted; and under any circumstances should carefully consider every portion of such instructions so far as they apply to the working of the instruments.

ON A FALL OF POTENTIAL CURVE IN A CHARGED SUBMARINE CABLE.

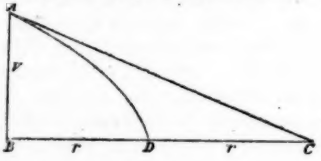
[By F. C. WEBB and H. R. KEMPE.

When a cable insulated at both ends is charged by means of a battery the potential of the charge will be the same at all points along its length, and if the two ends be put simultaneously to earth it is clear that the charges flowing out of them will be equal.

Since the flow is from the middle point of the cable towards the ends it is evident that this point will keep its potential a maximum above all other points along the length of the cable, and further that this maximum point in sinking down to zero will trace out a straight line.

The case of a cable charged with one end to earth is different. Here the point of maximum potential at starting will be at the end of the cable to which the charging battery is connected. If now this point be put to earth, the cable will discharge itself at both ends as in the first case, but the flow at the two ends will be different, and the point of maximum potential will shift away from the charging end of the cable.

In the Fig. let B C be the cable whose end C is



to earth, and whose end B is connected to a battery, and let A B or V represent the potential of the charge.

On consideration, it will be evident that the less the amount of charge remaining, the more uniform will become the distribution of the potentials along the line B C, and, finally, at the moment when the charge becomes zero, the distribution of potentials will be the same as in the case first-mentioned, that is to say, the point of maximum potential will be at D, a point exactly bisecting B C.

Now, since at commencing the point of maximum potential is at A, and at the conclusion at D, it is evident that during the interval it will follow a line intermediate between A and D; and as the flow to the two ends must always take place on either side of the line of maximum potential, the areas on either side of this line or curve must represent the relative quantities flowing out at the two ends.

In a previous paper* it was shown that when a charged cable, the further end of which was to earth, was allowed to discharge itself simultaneously at both ends, twice as much flowed out at the nearer as at the further end. In the case before us, if the area of the triangle, A B C, represent the charge in the cable, the form of the curve between the points, A and D, must be such that the area A B D is twice the area A D C.

Now the area of the triangle A B C is—

$$\frac{V(r+r)}{2} = V r$$

and the area of the figure A B D is to be twice the area of the figure A D C; that is, it is to be two-thirds of the area A B C; that is—

$$\text{area of } A\,B\,D = \tfrac{2}{3} V r$$

Now, as is well known, in order that this equation may be satisfied, the curve between A and D must be a *parabola*, which is therefore the curve traced out by the point of maximum potential in falling to zero.

* On the Flow of Electricity at the Two Ends of a Charged Cable. Vol. i. page 285.

Notes.

At the meeting of the Telegraph Engineers, on the 12th of April, Mr. C. V. Walker, F.R.S., F.R.A.S., the President, read a paper on "The Work-value of Electro-magnets enclosed in Iron." An abstract of this will appear in our next number.

At the meeting of the Telegraph Engineers, on the 26th, a paper by Mr. L. Clark, on "The Clamond Thermo-electro Pile," was read, a full description of which will appear in the columns of our next. The paper was illustrated by diagrams thrown by means of a magic lantern and oxy hydrogen light. A reflecting galvanometer was made to throw a spot of light on a scale situated on the opposite side of the theatre. The shape of the spot of light was made to assume various forms, including an arrow. The scale was about 25 feet long. The paper and experiments were very successful.

From a report of Mr. Plunkett, the Secretary to the Japanese Legation, we learn that of the mineral resources of Japan, copper is that which seems likely to be most run upon by Europeans. The ore is said to be of excellent quality and remarkably free from arsenic and antimony, two foreign

ingredients often to be met with, but which seriously impair the electro conductivity of the metal. To quote Mr. Plunkett's words,—"This is an important fact in the present day when submarine telegraphy is being pushed to so large an extent, and where the purity of the copper is of such paramount importance."

The severe snowstorm on the 13th caused considerable damage to the overground telegraphs.

The *Daily News* of the 15th stated that several miles of telegraph wires and posts on the side of the road between Huntingdon and Cambridge are laid low, and an idea of the violence of the storm may be gathered from the fact that some of the posts are as thick as a man's body, and they are snapped asunder.

The driver of the Great Western parcels delivery van had a narrow escape yesterday morning. He was driving along, when a hanging telegraph wire caught him by the throat. Fortunately he was thrown backwards, and thus escaped with no further injury than a bad abrasion of the skin.

At Rugby yesterday there was a still severer snowstorm than on Thursday, and it continued the greater part of the day. Postal and railway telegraphic communication was suspended, with the exception of a single wire to Stafford by the railway service. The ground was covered with snow to a great depth. There was a sharp gale of wind the whole of the time, which drifted the snow to an enormous extent in some places. Several telegraph posts were blown down, and in many instances wires gave way from the quantity of snow lodging upon them.

On the London, Chatham, and Dover line some of the poles were blown over so as to be caught by an express train, which tore down a portion of the line, and was obliged to stop to clear the wires from the train.

The correspondent of the *Standard* writing from Tring on the 16th says:—It will be impossible to telegraph any later information, as the wires between here and London have been broken down by the severe snowstorm of Thursday night, and have not yet been repaired.

The fine s.s. *Seine*, 3,493 tons gross, 2,243 net, 400 h.p., lately belonging to Mr. Morrison, and bought by Mr. Bates, has been re-sold to the Telegraph Construction Company.

The s.s. *Kangaroo*, 1,773 tons gross, 1,100 net, 160 h.p., has also been sold by Mr. Bates to the Telegraph Construction Company.

Both these ships have been employed before by the Telegraph Construction Company on cable work.

The s.s. *Sidney Hall*, which ship was last year employed on the Montevideo and Chuy cable, was sold a short time ago, by order of the Admiralty, to defray wages of crew, &c. She was bought by Mr. Carter, who has again re-sold her. Her telegraphic machinery and gear was to be sold by auction on Wednesday, April 26.

The Direct United States cable is again repaired, and is in full work now from Ireland to New Hampshire. The following from the *Telegrapher* bears on the subject of the breakages.

In reply to a correspondent of the Boston *Herald*, who alleged that the repeated breaking of the Direct Cable was due to its rival (the Anglo-American Company), and suggested retaliation in kind. Mr. M. J. Gaines, Superintendent of the Anglo-American Telegraph Company at Duxbury, Mass., in a communication to that paper, discusses at some length the causes of such misfortunes. Mr. Gaines thinks that the *Herald's* correspondent's suggestion is "a little rough on the rival company, especially when we remember that one of its own cables has been broken about four times as often as the Direct Cable."

He states that the cable from Duxbury to St. Pierre, which was laid in the summer of 1869, has been broken regularly every year since, except 1874; some times twice, and in 1875 three times during the year. He instances some singular coincidences of time and place in these numerous breakages. Thus, the cable has been broken on the 26th, 27th, and 29th days of May in different years, and all the breakages, with one exception, have been within the space of fifty miles, while five of them have been within the space of ten miles. This last little bit of water, he says, may well be called their hot corner. The owners and captains of the fishing boats that broke the cable have on several occasions been kind enough to report all the details of the accidents, which he proceeds to give as a conclusive demonstration that the breaking of the Direct Cable has been accidental, and not from malicious intentions or motives.

On the 4th of May, 1873, the cable was broken sixty-six miles from Duxbury by the fishing schooner J. W. Bradley, of Rockport, Mass. The facts in this case were that the day before the cable was caught it came on to blow severely. The schooner broke adrift just before night, and they had out about one hundred and eighty fathoms o cable. In the morning, when the schooner hove up they supposed the anchor had caught bottom After about eighty fathoms had been hove in they found their anchor was hung, and continued to heave for six hours, getting only a turn on the windlass as the schooner pitched down as the sea rose and fell. At last they saw they had the cable, and while waiting to devise the best way to clear

their anchor, the cable parted. "This," Mr. Gaines says, "is the way it is done. It is always the same story, with variations only of time and place. The skipper hooks the cable, heaves up his chain as far as he is able, putting a severe strain on the telegraph cable, and then swings to it, a heavy sea strikes him, or a tremendous ground swell throws him upward like a cork, and something has got to smash. That something is generally the cable, being weakest." On one occasion they brought up an anchor fast to the cable, while repairing. In that case the chain was no doubt the weakest; but this is rarely the fact.

The communication gives details of several other similar breakages, the general features of which are similar to that above cited, varying only in the details of the accident.

Quoting from the report to the managers of the Direct Cable Company, made by Messrs. Thomson and Bramwell—"The foregoing considerations make it clear to us that if a fishing vessel having hooked the cable accidentally brought it up to the surface, and endeavoured to get the anchor on board, the cable could not be broken in the process."—Mr. Gaines says, "This is theory. I have confronted it with fact; and I submit the whole matter to the impartial judgment of the public."

In reference to the further statement in the report, that the fact that the cable laid for more than a year in 1874-75, when not in use, without being broken, "is evidence of the strong improbability of the reported ruptures which have since occurred being produced accidentally by fishing vessels in pursuit of their ordinary calling," Mr. Gaines says it is quite a remarkable fact that the Duxbury cable was similarly fortunate. From the 1st of September, 1873, to the 28th of May, 1875, it suffered no damage whatever from any cause.

The *Professor Morse*, which sailed from New York on March 23 for the purpose of repairing one of the Cuba and Key West cables, arrived at Key West, Florida, on March 31st, and left for Havana on April 4th, for the purpose of commencing work on the cable.

The firm of Emile d' Erlanger which had obtained the contract for laying and maintaining a cable from Orbitello to Sardinia, by a convention, dated July 27th, 1874, has made over the contract to the Eastern Telegraph Company.—*Annales Telegraphiques.*

An instrument for working six transmissions simultaneously is actually in work between Paris and Lyons, and gives 150 messages per hour on one wire. Certain difficulties had been experienced in establishing a regular service between Paris and Marseilles by the quadruplex system. These difficulties have been overcome by the application of a system of reverse currents, invented by M. Willot, an employé at the central station at Paris.—*Annales Telegraphiques.*

A new method of giving warning of fire has been suggested by Messrs. Soly and Barbier of Paris. A cable containing two wires, insulated by guttapercha, is run through the various parts of a building. The two ends of the wires at one extremity of the cable are connected to a battery and a bell, the other two ends are left insulated. If fire occurs at any part of the cable, the insulating coating melts, the wires make contact, and the bell rings.

Mr. Hugh Neilson, assistant manager in the Dominion Telegraph Company, was examined before the Canadian Parliamentary Committee, to inquire into the advisability of extending telegraphic communication in the Gulf of St. Lawrence, March 19.

Mr. Neilson said that the cost of submarine cables is regulated by the depth of water, nature of bottom, and exposure to strong currents, ice, and heavy seas. To connect the Island of Anticosti, it would be preferable to extend the telegraph line from Murray Bay, down along the north shore, to a point opposite the west end of Anticosti, and there connect by means of a submarine cable which would be about twenty miles long. This would enable Quebec to work to the very eastern end of the Island of Anticosti with one circuit, which is very important. For this submarine cable you would require fifteen miles, costing about £100 stg. and five miles of shore ends at £100 stg. It would require a cable of one single conductor composed of seven copper wires with the ordinary protective wires. With ordinary facilities the land line on the Island of Anticosti, and also the land line from a point opposite the Island of Anticosti to Murray Bay, would not cost more than 100 dols. per mile. A cable from the S. W. end of the Island of Anticosti to Griffin's Cove on the coast of Gaspe, about 38 miles, would cost on an average about £200 stg. per mile. A cable from L'Anse à la Croix on the south shore of the St. Lawrence to Pointe des Monts on the north, 24 miles, would only cost on an average £200 stg. The laying of this line would entail more expense in the management than one from the west point of the island to the north shore, for the reason that a repeating station, requiring an expert hand, would have to be established at the S. W. point of the island, and messages would have to be repeated from there to the east and west points of the island, whilst the cable from the west point to the north shore would form part of the direct line to Quebec. From Bird Rock to the

nearest Island of the Magdalen group, sixteen miles, the cable would require to be of the strongest and best manufacture, and would cost about £375 sterling per mile. A line between the Magdalen group and Cape St. Lawrence in Cape Breton, or the nearest point in Prince Edward Island, the first forty-eight miles and the second forty-five miles, would cost on an average £200 sterling. Mr. Neilson said he had given his estimates of the land lines for the best galvanized telegraph wires. He then made some statements relative to the general cost of building telegraph lines, and the committee adjourned.—*Telegrapher.*

The Anglo-American Telegraph Company (Limited) announce that the Brest-St. Pierre Cable was broken on the morning of the 26th, at a distance of about 200 miles from Brest. The company's s.s. *Minia* was then at Gravesend ready for sea, and will be despatched as soon as possible to restore communication.

THE ELECTRIC ANEMOMETER OF M. HARDY.

By M. GILLET.

M. HARDY was entrusted by the town of Puy with the construction of a system of electric apparatus, for the purpose of transmitting automatically to the point of observation, situated in the museum of the town, the indications given by an anemometer placed upon the plateau of Ronzon, situated about 1 kilometre from the museum, and at an elevation of 150 metres above the level of that establishment.

By means of a *single* electric wire connecting the anemometer with the point of observation it was required—

1st. To register on the paper band of an instrument, fixed inside the museum, the velocity of the wind and its eight principal points of direction.

2nd. To indicate at the same time, upon dials placed outside the museum, the velocity and direction of the wind and the variations of barometrical pressure in such a way as to enable the public to read the indication.

The anemometer fixed upon the plateau of Ronzon is composed of a mast surmounted by a revolving cross-piece (*moulinet Robinson*) to measure the velocity of the wind, and a weather-cock to show its direction.

The cross-piece is formed of four hollow hemispheres, placed at right angles, and turning horizontally. The concavity of one hemisphere and the convexity of another are constantly presented to the wind; it follows, therefore, that the former alone receives almost the entire pressure of the wind, and the cross-piece, acted upon by one arm of the lever, moves around its centre, and always in the same direction. The particular arrangement of this little apparatus has long ago enabled the fact to be ascertained that there is a law of connection between the space traversed by the wind and that passed over by the hemispheres—the latter is one-third of the former. When the number of turns made by the cross-piece in a second is ascertained, it is then easy to arrive at the velocity of the wind.

The weather-cock has the appearance of a water-wheel moved, not by water, but by the wind, in which the transverse troughs have been removed and the two circular plates furnished with sloping wings similar to those of a windmill. In consequence of this arrangement, the wheel turns about a horizontal axis, and when the wind blows upon it in an oblique direction, it can besides move about a vertical axis, until presenting its section to the wind, and placing itself consequently in the direct line of the same, the latter, as in the case of ordinary weather-cocks, ceases to act. The cross-piece in turning carries with it a toothed wheel furnished with six pins, and moves the same forward, one tooth for each turn of the cross-piece; the six pins rub in succession upon a spring; the wheel is connected with a battery, and the spring with the line.

This wheel is a real commutator, sending a current at each contact of the spring with the pins, and thus indicating by the number of currents sent in a given time the speed of the cross-piece, which is one-third of that of the wind. The apparatus is constructed in such a manner that the passage from one pin to the next corresponds to a speed of 2 kilometres per hour.

The action of the weather-cock is the same: as it turns it brings a rubbing spring into contact successively with four metallic segments; the spring is in connection with a battery, and each segment with a line. This combination also forms a commutator, sending a current into the line at each contact of the spring with the four segments.

These arrangements being made, let us suppose that within a fixed period of time it is desired to transmit to the end of the line five perfectly distinct indications: 1st, the four principal directions of the wind; 2nd, its velocity. All that is necessary is to apply the principle of the distributer in the multiple apparatus of M. Meyer.

For this purpose the anemometer and the museum are provided with two clocks, each of which communicates motion to a disc, which makes contact successively with five springs, and is itself in permanent connection with the line; the five springs of the disc of the anemometer communicate with the four segments of the weather-cock on the one hand, and on the other with the spring of the cross-piece; and the five springs of the disc of the museum are connected with five electro-magnets. Moreover the movements of the two clocks are combined in such a way that the contacts of the disc with the first four springs last four minutes (one minute for each contact, these being the contacts for direction of wind), and the contact of the disc with the fifth spring lasts three minutes (the contact for speed).

It will thus be seen that during four minutes the line as well as the four electro-magnets at the Museum are put into connection with the four segments of the weather-cock, and during the next three minutes the line as well as the fifth electro-magnet at the Museum are put into connection with the spring of the cross-piece. These five electro-magnets are arranged in such a way as to mark upon a running paper band, similar to that of a Morse Machine, as follows—1st. Four lines of

marks, one below the other which in their order represent the four directions of the wind (in the case of the intermediate points, the N.W. for example, they are represented by the transmission of the two points rather closely together, the point N. and the point W). 2nd. A second row of marks represents the contacts of the spring with the pins of the cross-piece. As already stated, each contact and consequently each mark upon the paper band, indicates exactly a velocity of 2 kilometres per hour.

Finally, when the seven minutes have elapsed, three minutes more are devoted to the regulation of the synchronism of the two clocks, which may have slightly varied.

For this purpose the two discs are mounted upon a movable frame, which by falling disconnects itself from the disc; the latter then, by the action of a weight, returns to its first position, as does also the movable frame, which again engages the disc, and a new series of movements commences, indicating during the next ten minutes the direction and velocity of the wind, and regulating the synchronism.

A third apparatus reproduces *for the public* the same indications as the first, but in place of marks upon a paper band the letters N.W.S.E., either singly, or in combination, appear upon small screens. The latter are seen during four minutes through openings in a dial, and they disappear at the end of a period of seven minutes.

The velocity of the wind is shown upon a dial, graduated for every two kilometres, in front of which moves a hand. This hand and the four screens which show the direction of the wind derive the former its alternate and the latter its circular movement from the same currents which, sent from the anemometer, mark upon the receiving apparatus previously described the directions and velocity.

Upon this third apparatus, a dial properly divided according to the altitude of Puy (650 metres) and the barometric pressure corresponding to that altitude, reproduces the movements of a very sensitive hand, which is moved by an aneroid barometer.

Besides the ordinary pressure, this dial also shows the maximum and minimum pressure during 24 hours by means of two supplementary hands, carried right and left by the principal hand, which, when abandoned by the latter, remain in their position, and do not follow it in its retrograde movement. These two fixed positions are the maximum and minimum for the day.

Twice a day, at noon and at midnight, a current sent by the clock of the anemometer to a special electro-magnet brings back the two supplementary hands to a position under the principal one; and during 24 hours they are again acted upon by the latter.

To sum up; three peculiar features characterize this system:—

1st. Transmission, *by a single wire* and to *any distance*, of the indications of an anemometer, which can therefore be fixed in any desired position.

2nd. Simultaneous registration of the direction and velocity of the wind upon a paper band.

3rd. Exactness in the results obtained, no matter what variations may take place in the synchronism; for as the clocks check and regulate each other every 10 minutes, errors can only occur in a fraction of that time, and cannot be carried beyond the end of that period.—(*Annales Télégraphiques.*)

Proceedings of Societies.

THE SOCIETY OF TELEGRAPH ENGINEERS.

ORDINARY GENERAL MEETING, 8TH MARCH, 1876.

THE discussion upon Dr. Werner Siemens' paper "On Submerging and Testing Telegraphic Cables," was resumed by:

Mr. W. H. Preece, who, after paying a tribute to the services rendered to submarine telegraphy by the author of the paper, alluded to the experiment made by Sir William Brooke O'Shaugnessy, who communicated to the Asiatic Society, as far back as September, 1839, his mode of insulating buried wires. It was done by enclosing a wire in a split rattan, and then paying the rattan round with tarred yarn. The first practical experiment, however, actually made across any water was that organized and carried out by the president of the society, Mr. C. V. Walker, F.R.S, 10 years later, in 1849. Then, in 1850, was laid the first actual submarine cable between England and France, and the following year, through the exertions of one whose name is seldom mentioned—Mr. Crampton—the Dover and Calais Cable was submerged. It was Mr. Crampton who found the capital and means, and who designed and adopted that form of cable which has never since been departed from. The wire rope which constituted this first cable is the characteristic of every one since laid. It is true that there have been improvements in their construction, in the core and in the strength of the external protection, but the wire rope still remains the type of all submarine cables.

The paper deals with that intricate point connected with the laying of cables, namely, the slipping back along an inclined plane as the cable falls from the stern of the ship to the bed of the sea. A cable falling at an angle through the water simply slides through it, just as a piece of paper slips through the air. To resist that tendency to slip down, it was necessary to apply to the cable a brake-power equal to the length which would be suspended between the ship and the bottom of the ocean. Practical details of the brake-power used, the variation of brake-power according to the depth of water, or any facts which tend to prove the truth of the theories advanced would be highly prized, and it is a matter of surprise that theory is still constantly brought forward, and so little heard of practice after all the experience of recent years.

There is a marked discrepancy between Dr. Siemens' formulæ and those established by Messrs. Longridge and Brooks many years ago in their well-known paper read before the Institution of Civil Engineers. The latter, however, most nearly accord with practice, for upon them have been based the submerging of most of the cables laid up to a very recent date. They showed that the friction of the rope and water varied as the square of the velocity; but Dr. Werner Siemens here

urges that it is not the law of the squares which is followed, but that the friction varies as the actual velocity itself. Without any reasons being given, and without any practical details to support this assertion, reluctance must be exhibited in accepting it. For it is well known that when water or air flows through pipes the friction varies as the square of the velocity, and it is difficult to see what difference can exist between water falling through the pipe and the pipe falling through water. If the friction of water varies as the square of the velocity in a pipe, the friction of a rope through water must, one would think, follow the same law.

As regards the second portion of the paper, viz., that of testing, Mr. Preece expressed the debt which was owing to Messrs. Siemens for having placed the subject on the basis which it now occupies. To them is due the form of Bridge now adopted which was one of the first steps taken to place testing on its present exact footing. Dr. Siemens' method of eliminating earth currents was fully discussed upon a late occasion, when Mr. Fahie's interesting paper was read and discussed; and although it is now treated by Dr. Siemens with his usual thoroughness, it cannot be said that the subject is much further advanced than it was when the paper referred to was read.

Although the localisation of faults is no doubt an important thing, yet our knowledge is valueless unless some means can be ensured by which we can get hold of the fault. It is one thing to lay a cable, and it is another to bring it to the surface again. The materials and the structure may have been altered since the first cable, but still perfection is not yet reached. The last Atlantic cable may be taken as a sample of what cables are, and the form is radically bad. We cannot at any future time be certain that it can be brought to the surface again. The outside coating of wire and hemp must in course of time rust and decay.

We can but hope that amongst the many now employed in the maintenance of cables some one may be found who will invent a cable which will be laid with the certainty of durability equal to that of gutta-percha itself. Practically, gutta is indestructible, if the ravages of the teredo are excepted; and until we succeed in getting an outside coating as strong as the present form and as durable as gutta-percha, perfection in deep sea cables cannot be said to have been reached.

Mr. Longridge, C.E., having been invited to attend the meeting, referred to the remarks made by Mr. Werner Siemens upon the paper read by Mr. Brooks and himself eighteen years before. At that time great doubts were expressed whether a cable could be laid along the sea bottom in a straight line; the first problem in its most general form, was to ascertain the curve formed by the cable suspended in an oblique direction in water, if paid out with a strain upon the sea-bed. The position of the cable might be easily found if there were no strain at the bottom, but the question as it stands is much more complicated. The various questions which arose in the laying of a line of cable were likewise dealt with by us, and Dr. Siemens alleges, "one of the first principles taken by them for granted, which materially influences the results is incorrect." This is a grave accusation, and refers to the assumption which we are said to have made, that the friction of the cable sliding down through water was proportional to the square of the velocity. He asserts it to be proportional to the velocity itself: and as he could not have made this assertion without some basis, it is to be regretted that he did not point out what his facts in support of this statement were. Colonel Beaufois' experiments distinctly prove that the lateral friction of a body passing through water varies from 1·8 to 1·947; that is, is proportional nearly to the square of the velocity, and before the Institution of Civil Engineers the question has been discussed more than once. In one case worth mentioning, Mr. Hawksley distinctly stated that the resistances of bodies passing through water varied exactly as the square of the velocity, and no one at the time contradicted him. We know that this is the case in pipes, and it does not recommend itself to one's mind to say that there is one law for the inside and another law for the outside of pipes.

Dr. Siemens' formulæ being based upon this assumption, stands or falls with it; except in this one particular they agree with ours. The theory propounded 18 years ago by us has never yet been controverted, and this fact hardly justifies Dr. Siemens in claiming that the cables which have been laid have been laid upon *his* theories.

In his paper it is further stated "that the work (alluding to that by Mr. Brooks and myself) is deficient as regards the clear perception of the principal factors and a lucid exposition of the results." A question of high mathematics, it must be admitted, is rather difficult to render lucid to the general reader; and as regards a clear perception ot the principal factors, it will be found, I think, that we dealt with them a great deal more than Dr. Siemens has done.

Having entered fully into the question of the various problems dealt with, Mr. Longridge went on to say that they were all solved with mathematical correctness, and the results arrived at were practical and reliable; consequently Dr. Siemens goes too far in making the assertion about a clear perception of the principal factors.

(To be Continued.)

ROYAL INSTITUTION.

Professor Dewar, of Cambridge, gave the "Friday evening discourse" at the Royal Institution, his subject being the "Physiological Action of Light." He first referred to the experiments of Du Bois-Raymond, who found that strong muscular movements of the arm and leg produced changes in electrical condition which could be easily detected by a galvanometer. We have now the Sir W. Thomson's reflecting galvanometer, a much more delicate instrument, and it occurred to professor Dewar that it might be possible to detect much more delicate changes than Du Bois-Raymond could. He showed, by having two troughs connected with the galvanometer and containing saline solution, that putting one hand in each the mere muscular effort of shutting one produced a difference in the amount of the electric current. Other experiments also showed how readily the slightest change of electro-motive force could be in this way detected. It had occurred to him that the test might be applied to the excitation of the external organs of sense, especially with regard to the eye.

Professor Dewar then proceeded to explain the way in which experiments on eyes of different animals were effected. The eye, on being removed from a recently killed animal (in this lecture frogs were used) is placed between two little supports which are called electrodes, and are thus constructed: There are two little troughs, made of zinc, mounted on vulcanite plates and carefully amalgamated. A small glass tube, drawn out to a point, is nearly filled with fine clay, and this is placed on the trough, the sulphate of zinc coming some little distance up the tubes. The ends of the tubes present only minute clay points. The object of this is to protect the animal structures from the irritant action of the solution of sulphate of zinc. These electrodes may be regarded simply as an arrangement for collecting and conducting off electrical currents from the structures under examination. Wires are connected from the troughs with the galvanometer, arranged so that the current can be cut off or put on at any moment. This arrangement is now found applicable for the examination of the eyes of living animals as well as of those recently killed. In the case of animals just killed, the recently removed eye is skilfully placed between the two clay points of the electrodes, and then the moment the connection is made with the galvanometer the mirror on the needle is seen to swing round, indicating the presence of an electric current. In a short time its reflection will settle down at some fixed point on the scale, and the amount of deflection will indicate the natural electric current passing from the corner to the transverse section of the nerve. Since almost every variety of living animal tissue shows an electrical current when examined in this way, it became an important question to see how much of the action here was due to light. To test this it is easy to put the eyes with the electrodes under a dark box with slide shutter. This was done, and time was allowed for the oscillating reflection on the mirror to settle, indicating the natural electric current which kept the needle of the galvanometer at a fixed position. Light was then allowed to fall on the eye, and at once a movement along the serum of the reflection of the galvanometer needle indicated a change in the electric condition of the eye produced by the light. The next consideration is whether this action occurs in any particular part of the eye. To test this the front part of the eye is cut away and one of the clay points brought in contact with the retina. This is an important point, because the change produced by the action of light might be supposed to be due to the contraction of the iris, the iris being a muscular structure contracting on the action of light by a well known reflex mechanism in normal circumstances, and even after the removal of the eye from the head. A contraction of the iris might produce a negative variation of the electric current. This is why it is removed. The action observed accorded with that of the complete eye. The current is affected when light shines on the retina. Still further experiment, that of picking out the retina and leaving only the sclerotic, showed that while a current was obtained it was not affected by light. Therefore it seems certain that the variation produced by the action of light is due to some change which light effects in the retina. The experiments so far mentioned were, of course, made on eyes taken from recently killed animals, and up till lately there have been difficulties in experimenting in warm-blooded animals, owing to the rate at which the eye dies after removal from the body. Professor Dewar has, however, found that by placing an animal in such a position that some saline solution can be retained on its eye, and placing on this solution one of the electrodes with the other electrode on another part of the body successful experiments can be made. He has had the experiments tried on himself, so that there can, he explained, be no severe charge of cruelty to animals in experimenting on living rabbits, cats, lobsters, &c., as he has. The general conclusions arrived at are in accordance with those made on eyes recently removed from dead animals. Considerable difference is noticed whether the light brought near the eye is fixed or moved about. A light was arranged to oscillate by suspension, and the amount of deflection produced on the scale is far in excess of that when fixed. Due care was taken, as far as possible, to ascertain that heat had nothing to do with this action. Professor Dewar then went on to speak of experiments on the time occupied in a nervous sensation. The instrument used was the chronograph of Regnault, made by Kœnig, of Paris. It consists of a large tuning-fork, giving 200 vibrations a second. This is placed in an upright position, and is kept in constant vibration by an electro-magnetic apparatus. A stilette is placed on one of the arms of the tuning-fork, and in front of this is a strip of blackened paper, pulled down gradually by pulley, and arranged so that the stilette can mark on it. Each oscillation of the fork indicates the one-two-hundredth part of a second. Then on each side of this vertical tuning-fork, and on a level with the stilette, is another electrical appatus, consisting of an electro-magnet, the prolonged armature of which carries a marker. As a current passes, the marker descends, making a mark on the blackened paper. It is arranged so that one of these markers signals on the paper the moment the light is put on; the other, under the control of an observer, signals directly the reflection of the galvanometer is seen to move. The position of these marks, with reference to the vibrations traced by the fork on the paper (200 a second), gives the interval of time. It was found that with a frog's eye it was 8-200, or 1-25th of a second. This, however, includes also the time the observer took to see the phenomenon and record it, so that the real time elapsing between the admission of light and the change in electric condition is less than that. Other experiments show that there is an alteration in the electro-motive force by continued action of light, and this is, no doubt, the physical representation of what, in physiological language, is called fatigue. A number of tables showing the rate of fatigue were exhibited.

Telegraph Companies.

THE WEST INDIA AND PANAMA TELEGRAPH COMPANY.

THE report of the West India and Panama Telegraph Company (Limited) for the half-year ending December last shows that the receipts amounted

to £28,523, and the expenses to £21,160, leaving a balance of £7,363, which, with £1,606, brought forward, makes £8,969 to be carried forward to next half-year. The report states that the subsidies received during the half-year amounted to £3,740, and credit has been taken in the accounts for £4,643, voted by British Guiana, but not yet paid; and it adds, regarding the other subsidies, that if the Acts reported to be passed become law, the renewed grant of the whole of the subsidies, amounting to £16,800 per annum will be obtained. —(*Daily News*, 19th April.)

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY.

THE trustees of the Telegraph Construction and Maintenance Company (Limited) Second Bonus Trust have announced that the second distribution, under the trust-deed, will be made on and after the 1st May next, at the rate of 2s. 3d. per £5 certificate, and will be payable at the banking-house of Messrs. Barclay, Bevan, and Co., Lombard-street.

Review.

Railway Appliances—By JOHN WOLFE BARRY, M.I.C.E.

(Concluded from page 128).

There are, of course, many systems of signalling trains, and Mr. Barry is no doubt correct in that he quotes at p. 145, but, if so, it is to be regretted such a system is in operation. The "warning" signal is not usually followed by the blocking of the line, nor is this generally done until the "departure" of the train has been announced. No doubt, however, the example he has given will be fairly understood. His other remarks on audible signalling are very good. The registration of every signal in a book is advocated; the advantage of a "time" signal once a day pointed out; and the employment of bells at level crossings pronounced desirable.

The single needle, double needle, Spagnoletti's Tyers', Bartholomew's, Walker's, and Preece's systems are illustrated. With regard to the date of the introduction of Mr. Walker's semaphore system, we fear there is a slight error; 1855 is mentioned, but we think it was not until 1863 it was practically brought forward, and it was not used for some short time after this.

In dealing with Mr. Preece's system an error is committed, which it is only fair should be set right. Mr. Preece is the inventor of two forms or systems of block signal instruments—a three-wire, and a one-wire system. At page 154 it is stated the former is "worked by means of three wires to each instrument." Farther on the different instruments which, as a whole, form the three-wire system, viz., the switch, bell, and semaphore, are described. The reader would probably understand that three wires are required for each instrument. Such is not the case; three wires in all are used, and these are applied as follows: one for the bell communication, which is common to both stations, one to the semaphore governing the down, and one to the semaphore governing the up road. That a three-wire system is more expensive than a one-wire system is unquestionably true, but the expense, where railway companies are their own maintainers, is mainly confined to the first outlay. The cost of the instruments is no greater than that for a single wire system, whilst the advantages are such as to thoroughly compensate the outlay. We cannot agree with Mr. Barry "that the danger apprehended and guarded "against by the three-wire system has not been "found to exist to any serious extent, and that, "though theoretically more perfect than a system "worked by one wire, the three-wire system is "exposed to the disadvantages of increased com-"plication of mechanism, and of considerable "extra expense." Any system worked by a momemtary current cannot offer that security obtained by a permanent current, such as is used with three-wire systems, and instances are not wanting to prove this; whilst, as regards "complication of mechanism," all single wire systems are immeasurably more complicated than three-wire systems.

After referring to Mr. Walker's "train describer," and affording some explanation of an "electric stop signal," which we believe to be the invention of Messrs. Tyre and Norman, the author proceeds to weigh the advantages or otherwise of the block system. The "suggestion that the block system "introduces new dangers, which is the heaviest "charge against the system, is endorsed by some "railway authorities brought up under the old "system of time signalling," is a remark we as cordially endorse, as do we the following conclusion, arrived at, after considering the enormous traffic dealt with under a proper system of signalling upon one of our most important lines. "It is "probably the fact that, if the use of the block "system were to be suddenly suspended, the carrying power of at least the busy parts of our railway system would be diminished to an extent for which few people are prepared." As to whether the block system is restrictive to the carrying power of lines, the answer is in the negative, instances being quoted where trains are worked at the rate of 18 per hour over each line of rails. Pronouncing the block system a success, the author regards its adoption simply as a question of expense. "But the cost of "efficient signalling is a remunerative expenditure "both in developing the capabilities of a railway, "and in preventing those accidents which are not "only deplorable to all concerned in them, but are "extremely costly to shareholders in railway companies. The additional expense, therefore, is "not sufficient to constitute a valid objection "against this most valuable system." The chapter concludes with some very able remarks on "Objects to be aimed at in Signalling," which are worth the study of all connected with this important branch of railway working.

Towards the close of the volume we get a few pages on "Intercommunication in Trains." The rope system "cannot be said to be a success." "The electric system of communication promises "better." That in use on the South Eastern Railway is described, and with reference to the more general employment of such an application, the necessity of employing it for starting or stopping signals, or, at all events, in some such manner as

shall thoroughly test its working condition, is very properly advocated.

The author has placed before the student a useful book, affording information upon many points not hitherto generally obtainable, and it is to be hoped it will meet with the success it merits.

Parliamentary Intelligence.

SUSPENDED TELEGRAPH WIRES.

Mr. Anderson asked the Postmaster-General if his attention had been called to a statement by Sir John Hawkshaw that suspended telegraph wires were safe only for about 12 years; if he had heard that several fatal accidents had occurred from fractured wires falling in crowded streets; if he had observed, on the house at the south-west corner of Parliament-street, a large number of wires clustered on one support very much twisted, and evidently in an unsafe condition; if he had observed one on the west corner of Richmond-terrace that looked insufficient, as well as others in various parts of the City; and if he would arrange gradually to alter all wires in cities and towns to underground ones, or have the suspended ones carried where practicable in such a way as to cross streets at right angles, or make the distance between the supports at least seven feet less than the elevation, or in some other way reduce the risk? The hon. gentleman, after putting his question, said he was glad to observe that since he had given notice of it something had been done to remedy some of the dangers to which it referred.

Lord J. Manners said that he had read Sir John Hawkshaw's statement; that there had only been two fatal accidents in London from the falling of wires during the 17 years that had elapsed since they had been first placed overhead, and one of these accidents occurred 12 years ago; that the wires in Parliament-street had been made safe, and that the pole in Richmond-terrace would be removed. The wires in Parliament-street would, by-and-by, be placed underground. It was intended to substitute underground for overhead wires where possible, and to carry those that must remain overhead at right angles across streets whenever it was practicable to do so.

A TELEGRAPH CABLE PIERCED BY GRASS.

At a meeting of the Asiatic Society of Bengal, in Calcutta, says *Chambers' Journal*, a piece of telegraph cable was exhibited, showing that the india-rubber covering had been pierced by grass. The piercing was so complete and the contact of the grass with the copper core was so perfect that "dead earth," as it is technically called, was produced, and the efficiency of the cable destroyed. The species of the grass, owing to its dried-up condition, could not be determined. It was suggested as a probable explanation "that the seeds had become attached to the core when under water, and had afterwards germinated when the core was stored."

RUSTING OF IRON.

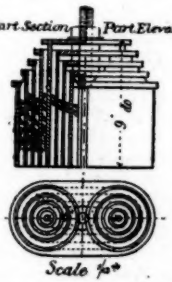
It has usually been supposed that the rusting of iron depends principally upon moisture and oxygen. It would appear, however, from the late Dr. Calvert's experiments, that carbonic acid is the principal agent, and without this the other agencies have very little effect. Iron does not rust at all in dry oxygen, and but little in moist oxygen, while it rusts very rapidly in a mixture of moist carbonic acid and oxygen. If a piece of bright iron be placed in water saturated with oxygen, it rusts very little; but if carbonic acid be present, oxidation goes on so fast that a dark precipitate is produced in a very short time. It is said that bright iron placed in a solution of caustic alkali does not rust at all. The inference to be derived is that, by the exclusion of moist carbonic acid from contact with iron, rust can be very readily prevented.—*Scientific American.*

Correspondence.

To the Editor of the Telegraphic Journal.

275, Lake-road, Landport,
April 22nd, 1876.

Sir,—Having seen in your Journal of January 15th, '76, Professor Osborn Reynolds' paper on "Electro-magnets," reminded me of an electro-magnet I designed and constructed some time since, the principle of which is somewhat similar to those constructed by Mr. J. Faulkner, with this difference, that it was of the horse-shoe form, and instead of one there were four tubes, besides the core in each pole, each tube increasing in size to allow of two turns of wire between them, with the exception of the outer one, and that was increased to allow of 7 turns; this magnet was capable of supporting 12 cwts. 1 qr. 14 lbs., and measured five inches between the centres by nine inches long. I have sent you a sketch of the same, to scale,



that it may be more thoroughly understood. The principle of its construction being original, I should feel obliged for the opinion of others upon it.

Yours truly,

J. Roper Penning.

To the Editor of the Telegraphic Journal.

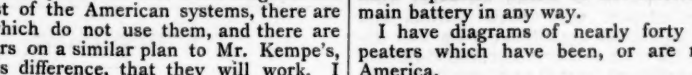
Toronto, Ontario,
March 29th, 1876.

Dear Sir,—In your issue of February 1st Mr. H. R. Kempe has an article headed "On a System

of Working by Translation on a Closed Circuit." He gives a diagram of a translator (or repeater as they are called here), which he says "is clearly applicable to the instruments in common use, and does not require any extra magnets, such as are used in the American systems."

Instruments arranged as in the diagram would not translate or repeat a single word on a closed circuit. It looks very well in theory, but in practice would be a complete failure. If Mr. Kempe had made an experiment before publishing the diagram he would have found that, during the instant while the relay armature is moving from the front to the back contact, there is nothing to prevent the relay on the other side from also opening. This difficulty can only be overcome by an arrangement for preserving the continuity of the circuit, similar to that used in the Stearn's Duplex Transmitter.

Although it is quite true that extra magnets are used in most of the American systems, there are repeaters which do not use them, and there are also repeaters on a similar plan to Mr. Kempe's, but with this difference, that they will work. I enclose you a cut and description of one patented



nearly ten years ago by Mr. B. B. Toye, Superintendent of the Montreal Telegraph Company in this city, and which has been in daily use ever since on a large number of lines. You will see that it would cost but a few shillings to make ordinary instruments available.

In the diagram M M' are the relay magnets of the eastern and western circuits respectively. S S' are the sounder magnets, which are connected with the relays and local batteries in the ordinary manner. These connections are omitted in the drawing to avoid confusion of lines. The flat springs, *a c* and *a' c'*, are supported by the standards P P', but are insulated from them by a piece of vulcanite rubber, as shown in the diagram.

E and W are the eastern and western line wires, and B is the point of connection with the main battery and ground.

At R and R' is a "resistance," which should be adjusted so as to equal that of the main line as nearly as practicable.

In the diagram the operator on the eastern circuit is supposed to be working, and at this moment has his key open. The western main circuit is broken by the lever of the eastern sounder at the points *c' d'*, but the western relay, M, is kept closed by a branch circuit from the battery at B, established through the relay points, *a' b'*, the sounder, lever, and standard, the resistance, R', and ground at G', and from thence back to the battery.

Now, if the eastern circuit be closed, the lever of the eastern sounder, S', will close the western circuit at *c' d'*, at the same instant breaking the branch circuit at *a' b'*. If the western circuit is broken, the same action takes place on the opposite side of the apparatus.

If both circuits are closed, each is complete through its own relay and respective points, *c d* and *c' d'*."

While admitting that this repeater works well, I consider the system bad. It is almost equivalent to working another line from the battery. When Grove Batteries were used this was not thought to be a serious objection, but now that we are using sulphate of copper cells, it would be preferable to have repeaters which do not interfere with the main battery in any way.

I have diagrams of nearly forty styles of repeaters which have been, or are now, used in America.

That known as the Hicks Milliken (which is in use on the Western Union Lines) seems to be nearly perfect.

Yours truly,

HUGH NEILSON.

DISTINCTIVE STAMPS FOR TELEGAPH MESSAGES.—A notice has been issued from the General Post Office to the effect that on and after Monday, the 1st of May, no postage stamps other than those embossed on the telegraph message forms still on hand, will be received in payment of telegrams.

THE Eastern Extension Australasia and China Telegraph Company (Limited) announce that their cable between Java and Australia is interrupted. Messages for Australia will be sent by post from Singapore on 1st May, from Java on 3rd May, or from Galle on 7th May.

To Correspondents.

*** Duly authenticated contributions, theoretical and practical, on every subject identified with the interests to which "THE TELEGRAPHIC JOURNAL" is the organ, will always command attention. Anonymous correspondence will be wholly disregarded. Literary communications and books for review should be addressed to the EDITOR; business communications to the PUBLISHERS, 10, Paternoster Row, E.C.